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Respiratory Protection Requirements in Agriculture

Guidance & Resources

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INTRODUCTION

Purpose of the Guide

This guide is intended to provide information and resources to assist in understanding respiratory protection program requirements, the applicable regulatory requirements, and how to select the type of protection based on inhalation hazards found in agricultural workplaces. The guide separates requirements into pesticide and non-pesticide respirator use at agricultural work sites. Some of the main differences between pesticide and non-pesticide respiratory programs are in the areas of exposure assessment, respirator selection, cartridge service life determination and record keeping.

In Part A, the single-page At-A-Glance guides provide a summary of pesticide and non-pesticide respirator requirements. More detailed expanded guidance for each program element is provided in Part D. The expanded guidance in Part D and linked references should be consulted as needed for a more detailed understanding of each program element. Respirator selection guides in Part B are provided to address a variety of agriculture hazards. Part C provides other resources including a table for interpreting NIOSH respirator TC numbers, a respirator program checklist and a fit test record form.

Written in support of a Michigan Occupational Safety and Health Administration (MIOSHA) Consultation, Education and Training (CET) Grant, this guide was developed to be a resource for all those involved in the Michigan Agricultural industry. Pesticide guidance is based on the national Environmental Protection Agency's (EPA) Worker Protection Standard (WPS) and EPA's Label Review Manual requirements. Non-pesticide respirator guidance references the MIOSHA respiratory protection standards for Agriculture, General Industry and Construction and provides examples of when each may apply. MIOSHA incorporates the federal Occupational Safety and Health Administration (OSHA) Respiratory Protection standard (29 CFR 1910.134) for both General Industry and Construction activities. The MIOSHA Part 700 Agricultural standard only applies in Michigan. The specific standard references are provided in the guide. **For those using the guide outside of Michigan, make sure to reference and use regulations specific to your state. Note that both**

EPA's WPS and federal OSHA standards apply to all states, but your state may have standards stricter than the federal standards.

Intended Audience

This guide was developed for use by those involved in the Michigan Agriculture and Agriculture Support Industries. The guide is also intended to support those involved in providing training and assistance in controlling respiratory hazards in those workplaces. Agriculture, as defined for this guide, includes those involved in the growing or harvesting of crops, the raising of livestock or poultry, or related activities conducted by a farmer on sites such as farms, ranches, orchards, greenhouses, dairy farms or similar farming operations.

While intended mainly for those in agriculture, other related professions may also find the guide applicable and useful including pesticide handlers in non-agricultural industries subject to the respiratory protection requirements on product labels. Examples may include golf course maintenance, pest control, arborists, lawn services and grounds maintenance. The guidance may also be helpful for other general industry or construction non-pesticide work site activities as described in Part D of this guide. The respiratory standards that apply are determined by the work being done at the time. The user should consult a safety professional if unsure what standard is applicable. MIOSHA CET provides free consultation services to small employers in Michigan. The manufacturer product Safety Data Sheets should always be reviewed for additional guidance including exposure limits, personal protection, leaks and spills, fire response, reactivity, storage, and first aid.

Agricultural Operations are defined by MIOSHA in ADM 06-7R6, Small Farming Operations and Small Employers in Low Hazard Industries – Guidelines for MIOSHA Activity (federally addressed in OSHA CPL 02-00-170, Enforcement Exemptions and Limitations under the Annual Appropriations Act). MIOSHA provides a listing of North American Industry Classification System (NAICS) codes and two-digit Standard Industrial Classification (SIC) codes considered to meet the definition of Agricultural Operations. In general, the North American Industry Classification System (NAICS) codes

beginning with 111 crop production, 112 animal production, and 1151 support activities for agriculture (except Cotton Ginning [115111] and Postharvest Crop Activities [115114]) are included. The complete listing of the NAICS industry classes and their descriptions as agricultural or agricultural support industries and can be found at North American Industry Classification System (NAICS) U.S. Census Bureau.

References for above paragraph:

1. MIOSHA Administrative Directive is located at the following website: Small Farming Operations and Small Employers in Low-Hazard Industries – Guidelines for Funding of MIOSHA Activity
2. OSHA reference is located at the following website: CPL 02-00-170 Enforcement Exemptions and Limitations under the Annual Appropriations Act

Disclaimer

This guide does not supersede any regulatory authority criteria or substitute for professional consultation or training. Respirator users and those overseeing use should ensure they have the appropriate level of competence and understanding necessary for the complexity and seriousness of the hazard and exposure situation. Always meet personal protection requirements on pesticide labels. Michigan State University (MSU) and Michigan State University Extension (MSUE) make no warranty or guarantee of any kind, expressed or implied, concerning the use of any stated products. Trade names are used for identification only; no product endorsement is implied, nor is discrimination intended.

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contents are the sole responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention or the Department of Health and Human Services.

Suggested Reference: Parsons E, Harduar Morano L. Respiratory Protection Requirements in Agriculture: Guidance and Resources. MSU Division of Occupational and Environmental Medicine; MSU Extension; August 2025.

Consultation, Education & Training Resources

Training in respiratory protection is an important step in understanding the principles involved in protecting workers from inhalation hazards. Respiratory protection training assistance in Michigan can be obtained through:

1. Michigan Occupational Safety and Health Administration (MIOSHA), Consultation Education and Training (CET)
2. Great Lakes OSHA Education Center
3. MSU Occupational and Environmental Medicine (OEM)

Online resources are available to develop respiratory protection training. Content can be found at the following:

1. "How do I find pesticide education resources, review manuals and applicator tests?" Article from MSU Extension Integrated Pest Management
2. Pesticide applicator study manuals can be found at this MSU extension site
3. MSU's Pesticide Safety Education Program website
4. Michigan Department of Agriculture and Rural Development's (MDARD's) Pesticide Certification Homepage
5. Respiratory Guides (to request respiratory guide hardcopies):
    a. Rutgers Respiratory Protection for Occupational Users of Pesticides
    b. Worker Protection Standard (WPS) Respiratory Protection Guide from Pesticide Educational Resources Collaborative (PERC)
6. National Pesticide Applicator Certification Core Manual 2nd Edition from the National Association of State Departments of Agriculture Research Foundation
7. Respirators Topic Page from the National Institute for Occupational Safety and Health (NIOSH)
8. OSHA's interactive Respiratory Protection e-tool which addresses selection, cartridge changes schedules and respirator basics
9. Respiratory protection training videos are available at no cost from OSHA

10. "Medical Evaluations for Workers who use Respirators" training videos available at no cost from OSHA
11. Air contaminant/respiratory protection topic page from MIOSHA
12. MIOSHA Workplace Safety and Health video streaming, which among other topics includes respiratory protection

List of Abbreviations

Abbreviation	Definition
AG	Agriculture Industry
ANSI	American National Standards Institute
APR	Air-Purifying Respirator
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CO	Carbon Monoxide
CO^2	Carbon Dioxide
CONST	Construction Industry
EGLE	The Michigan Department of Environment, Great Lakes, and Energy
EPA	Environmental Protection Agency
ESLI	End of Service Life Indicator
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
GI	General Industry
H2S	Hydrogen Sulfide
HE	High Efficiency
IDLH	Immediately Dangerous to Life or Health
MAC	MIOSHA Part 700 Ag Maximum Allowable Contaminant Level
MDARD	Michigan Department of Agriculture & Rural Development
Mg/m^3	Milligrams per Cubic Meter
MIOSHA	Michigan Occupational Safety & Health Administration
MSU	Michigan State University
NIOSH	National Institute for Occupational Safety & Health
O^2	Oxygen
OEL	Occupational Exposure Limit
OEM	Occupational & Environmental Medicine, Michigan State University
OSHA	Occupational Safety & Health Administration
PAPR	Powered Air-Purifying Respirator

Abbreviation	Definition
PEL	OSHA Permissible Exposure Limit
PERC	Pesticide Educational Resources Collaborative
PLHCP	Physician or other Licensed Healthcare Professional
PPE	Personal Protective Equipment
PPM	Parts Per Million
REL	NIOSH Recommended Exposure Limit
ROP	Roll-Over Protection
SCBA	Self-Contained Breathing Apparatus
SAR	Supplied-Air Respirator
SDS	Safety Data Sheet
TC Number	Testing and Control Number
TLV	ACGIH Threshold Limit Value
TWA	Time-Weighted Average
WPS	Worker Protection Standard
>	Greater Than
<	Less Than

PART A:
Respirator Program Elements At-A-Glance

Pesticide Respirator Program Elements At-A-Glance

Number	Elements	Regulations and recommendations
1	**Rules**	EPA 40 CFR 152 (Pesticide registration and classification procedures) and 40 CFR 170.507 (Worker Protection Standard [WPS]); MDARD Regulation 637 Rule 4 (Pesticide Use), **Agricultural Use:** Must Use WPS, Safety Data Sheets (SDS) **Non-Agricultural Use:** Use label, SDS
2	**Selection**	**Label prescribes NIOSH respirator type**: **TC-84A** – N, R, P filtering facepiece, air-purifying respirator (APR) with particulate filter or chemical cartridge with particulate filter. **TC-23C** – Powered APR (PAPR) with chemical cartridges. **TC-21C** – PAPR with particulate filter (HE). **TC-19C** – Supplied-air respirator (SAR). **TC-13F** – Self-contained breathing apparatus (SCBA) or SAR with a SCBA escape bottle.
3	**Medical Evaluation**	*Must occur before fit testing or use*. Medical questionnaire completed by healthcare professional. (Sections 1 and 2, part A of Appendix C in MIOSHA Part 451, 1910.134.)
4	**Fit Testing**	Initial (before use) and annually for each type used per WPS. Use MIOSHA Part 451, 1910.134 Appendix A test procedures.
5	**Training & Information**	Before use and annually per WPS. Training should cover routine use, emergency use, and limitations of use.

Number	Elements	Regulations and recommendations
6	**Cartridge Change Schedule**	**Particulate:** If breathing resistance becomes excessive. If filter element has physical damage or tears. If product labeling specifies less time. Maximum = 8 hours per WPS. **Gas/Vapor:** Manufacturer advice based on known exposure level, *OR* Product label if less, *OR* Maximum = 8 hours per WPS. In addition, OEM recommends cartridge with End of Service Life Indicator (ESLI) be used. **Tractor/Sprayer Cab Filter Cartridges:** See Part B Guidance in this document.
7	**Hygiene & Condition**	Procedures for cleaning, disinfecting, storing, inspecting, repairing, discarding and maintaining PPE. Follow label precautionary statement, manufacturer and Michigan EGLE for waste requirements. (Contact: 800-662-9278, EGLE-Assist@michigan.gov).
8	**Supplied-Air Systems**	Must meet ANSI/CGA G-7.1-1989 Grade D Quality (oxygen 19.5% – 23.5%, hydrocarbon condensed max 5 mg/m^3, CO <10ppm, CO^2 <1000 ppm, and lack of noticeable odor). CO alarm required to ensure CO <10 ppm. Signed record of most recent sorbent bed and filter change must be attached to compressor.
9	**Documentation**	Minimum 2 years per WPS.
10	**Program Review**	OEM recommends annually

Reference: "Worker Protection Standard (WPS) Respiratory Protection Guide, Requirements for Employers of Pesticide Handlers", Pesticide Educational Resource Collaborative, Revision 2017.

Non-Pesticide Respirator Program Elements At-A-Glance

Number	Elements	Regulations and recommendations
1	**Rules**	MIOSHA Standard Part 451 Respiratory Protection applies to General Industry and Construction work (incorporates OSHA 1910.134 Respiratory protection). MIOSHA Part 700 applies to agriculture non-pesticide work. Air Contaminant Maximum Allowable Levels are in MIOSHA Standards Part 301 (GI), Part 601 (CONST), and Part 700 (AG).
2	**Selection**	**Must assess exposure level versus Occupational Exposure Limits (MAC, PEL, REL, TLV)**. Select based on protection level needed to ensure inhaled concentration stays below the occupational exposure limit (OEL). **Note:** If exposure cannot be identified or reasonably be estimated, OSHA 1910.134(d)(1)(iii) requires selecting protection level for Immediately Dangerous to Life or Health (IDLH), which is a supplied-air respirator (SAR) with a pressure demand regulator and auxiliary self-contained air supply or a 30-minute self-contained breathing apparatus (SCBA). Oxygen deficiency is considered IDLH. If exposure will vary greatly throughout due to disturbances or releases of gas or vapor, protect at highest level and conduct direct monitoring while working. **TYPES: TC-84A** – N, R, P filtering facepiece, air-purifying respirator (APR) with particulate or chemical cartridge with particulate filter; **TC-23C** – Powered APR (PAPR) with chemical cartridges; **TC-21C** – PAPR with particulate filter (HE); **TC-19C** – SAR; and **TC-13F** – SCBA or SAR with a SCBA escape bottle.
3	**Medical Evaluation**	*Must occur before fit testing or use*. Medical questionnaire completed by healthcare professional. Use sections 1 and 2, part A of Appendix C in MIOSHA Part 451, 1910.134.
4	**Fit Testing**	Initial (before use) and annually for each type used. Use MIOSHA Part 451, 1910.134 Appendix A Fit testing procedures.

Number	Elements	Regulations and recommendations
5	**Training & Information**	Before use and annually. Training should cover routine use, emergency use, and limitations of use.
6	**Cartridge Change Schedule**	**Particulate:** If breathing resistance becomes excessive. If filter element has physical damage, contamination or tears. If product labeling specifies less time. **Gas/Vapor:** When the maximum use time is reached as determined by a change schedule conforming to the provisions of MIOSHA Part 451, 1910.134(d)(3)(iii)(B)(2), (based on objective data/breathing zone personal monitoring), *OR* cartridge manufacturer advice based on known exposure levels or limits of cartridges. In addition, OEM recommends cartridge with End of Service Life Indicator (ESLI) be used.
7	**Hygiene & Condition**	Procedures for cleaning, disinfecting, storing, inspecting, repairing, discarding and maintaining PPE. Follow MIOSHA Part 451, 1910.134(h)(1) and Appendix B-2 respirator cleaning procedures and Michigan EGLE for waste requirements. (Contact: 800-662-9278, EGLE-Assist@michigan.gov)
8	**Supplied Air Systems**	Must meet ANSI/CGA G-7.1-1989 Grade D Quality. (oxygen 19.5% – 23.5%, hydrocarbon condensed max 5 mg/m^3, CO <10ppm, CO^2 <1000 ppm and lack of noticeable odor). CO alarm required to ensure CO <10 ppm. Signed record of most recent sorbent bed and filter change must be attached to compressor.
9	**Documentation**	Fit Test = retain until next test. Medical = keep licensed healthcare professional determination for employment duration plus 30 years. Reference: MIOSHA Part 451, 1910.134(m) and OSHA 29 CFR 1910.1020.
10	**Program Review**	Regularly to determine efficiency of program and any user issues MIOSHA Part 451, 1910.134(l).

PART B:
Agriculture Inhalation Hazards & Respirator Selection

PART B: Summary of Selection Content

PART B-1 Understanding the Types of Respirators provides a visual and explanation of the types of respirators that are referred to in this guide and on pesticide labels.

PART B-2 Choosing an Air-Purifying Respirator (APR) and Cartridge Based on Agricultural Hazards *and* PART B-3 Choosing an Atmosphere-Supplying Respirator Based on Agricultural Hazards are meant to assist in respirator and cartridge selection based on the farming activity ***and*** hazards. Pesticide and non-pesticide farm inhalation hazards are addressed including but not limited to painting, welding, manure pit or silo entry. Atmosphere supplying respiratory protection is recommended for situations involving highly toxic chemicals, asphyxiation or when oxygen deficiency is possible. Examples include fumigation and manure pit or silo entry.

PART B-4 Air-Purifying Respirator Options by NIOSH Testing & Control (TC) Number *and* PART B-5 Atmosphere-Supplying Respirator Options by NIOSH TC Number show available respirator options when a TC number or type of respirator is named on the pesticide label. The table may also be used to find the allowed type of respirator when the different protection requirements are shown on the label. The options, when allowed, include selecting a tight-fitting or loose-fitting face piece, powered or non-powered air-purifying types of respirators and whether a respirator can be worn with facial hair.

PART B-6 Understanding Pesticide Label Respirator Terms provides guidance to help understand pesticide label hazard information including pre-1995 pesticide label terms sometimes still found on labels and how to interpret them to apply the correct updated TC number and respirator terminology.

PART B-7 Particulate Filter Efficiency and Oil Resistance Ratings describes the three NIOSH filter efficiency ratings and the three NIOSH oil resistance ratings for each. The recommendation is made to always use the P100, or HE filter (HE is for PAPRs) in a combination organic vapor/particulate cartridge for liquid pesticides.

PART B-8 Cab Filter Selection and Chemical Filter Service Life provides guidance on selecting a cab filter that is intended to reduce in-cab exposure during spraying of liquid pesticides. Organic vapor (activated carbon) and particulate combination cab filters that meet ASABE S613 national service life test standards are recommended.

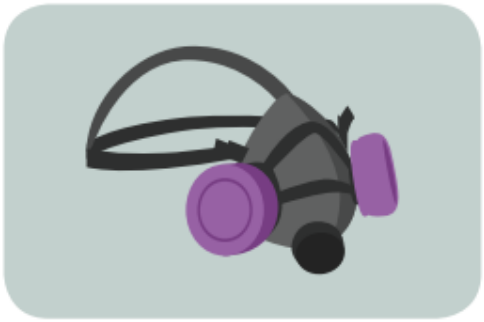
PART B-9 Worker Protection Standard (WPS) Reduced or Modified Personal Protection Equipment (PPE) Allowances is meant to provide a plain language interpretation of the conditions when the WPS permits reduced or modified PPE when in the cab. A flow chart and key point summary is provided.

PART B-10 Respirator Assigned Protection Factors (APFs) provide the protection factor afforded by properly selected and fitted respirators, and recommendations regarding the requirement to make reasonable assessment of exposure when selecting a respirator for non-pesticide use.

PART B-11 Reasonable Assessment of Exposure Determination defines and provides examples of the type and level of exposure assessment that may meet the MIOSHA Part 451 (Federal OSHA 1910.134) requirements to select a respirator to protect from non-pesticide hazards.

PART B-12 Personal Protective Equipment (PPE) Reuse, Cleaning and Disposal Considerations recognizes pesticide label precautionary statements, product safety data sheet guidance, MIOSHA and personal protective equipment manufacturer guidance. This section also addresses the potential applicability of hazardous waste disposal requirements when using certain hazardous chemicals and the equipment that may become contaminated with them including personal protective equipment. General information is provided including the Michigan Department of the Environment, Great Lakes, and Energy (EGLE) general process and considerations for characterizing potentially hazardous waste, and EGLE assistance contact information is provided.

PART B-1: Understanding the Types of Respirators



Elastomeric Half Facepiece Respirators are reusable and have replaceable cartridges or filters. They cover the nose and mouth and provide protection against gases, vapors, or particles when equipped with the appropriate cartridge or filter.

Elastomeric Full Facepiece Respirators are reusable and have replaceable canisters, cartridges, or filters. The facepiece covers the face and eyes, which offers eye protection.

Filtering Facepiece Respirators are disposable half facepiece respirators that filter out particles such as dusts, mists, and fumes. They do NOT provide protection against gases and vapors.

Powered Air-Purifying Respirators (PAPRs) have a battery-powered blower that pulls air through attached filters, canisters, or cartridges. They provide protection against gases, vapors, or particles, when equipped with the appropriate cartridge, canister, or filter. Loose-fitting PAPRs do not require fit testing and can be used with facial hair.

Source: Types of respiratory protection infographic found on the NIOSH PPE respirator topic page

Supplied-Air Respirators are connected to a separate source that supplies clean compressed air through a hose. They can be lightweight and used while working for long hours in environments not immediately dangerous to life and health (IDLH).

Example of an open-circuit SCBA

Self-Contained Breathing Apparatus (SCBAs) are used for entry into or escape from environments considered to be IDLH. They contain their own breathing air supply and can be either open circuit or closed circuit.

Example of an SAR/SCBA

Combination Respirators can be either a supplied-air/ SCBA respirator or supplied-air/air-purifying respirator. The SCBA type has a self-contained air supply if primary airline fails and can be used in IDLH environments. The air-purifying type offers protection using both a supplied-air hose & an air-purifying component and cannot be used for entry into IDLH environments.

Source: Types of respiratory protection infographic found on the NIOSH PPE respirator topic page

PART B-2: Choosing an Air-Purifying Respirator and Cartridge Based on Agricultural Hazards

Protection From Liquid Pesticide, Painting, Feed or Grain Dust, Mold, Organic Dust, poultry, Welding, Grinding, Sanding.

NIOSH TC number	Respirator Type	Color	Cartridge/Canister Type	Photo
TC-84A	Non-Powered–Elastomeric • Half or Full-Face • Tight fitting	Black and Pink	Combination organic vapor (OV) and P100** (particulate) filter cartridge	
TC-14G	Non-Powered–Gas Mask • Full Face • Tight-fitting	Olive and Pink	Combination multi-gas with organic vapor and P100** filter canister	
TC-23C	Powered Air Purifying (PAPR) • Tight-fitting • Loose-fitting*	Black	Combination organic vapor cartridge plus high efficiency (HE) filter	

Protection From Solid Pesticide, Feed or Grain Dust, Mold, Organic Dust, Welding, Grinding, Sanding.

NIOSH TC number	Respirator Type	Color	Cartridge/Canister Type	Photo
TC-84A	Non-Powered–Elastomeric or Filtering Facepiece (dust mask) • Half or Full-Face • Tight-fitting	Pink	N, R or P** 100 particulate filter Note: N = No oils present in mixtures. If oil is present, the R or P filter is required	
TC-21C	Powered Air Purifying (PAPR) • Tight-fitting • Loose-fitting*	Pink	High Efficiency (HE) filter	
TC-14G	Non-Powered–Gas Mask • Full Face • Tight fitting	Olive and Pink	Combination multi-gas with organic vapor and P100** filter canister	

Protection from Liquid plus Solid Pesticide, disinfectants, bleach, anhydrous ammonia, ammonia from livestock, formaldehyde, organic vapor

NIOSH TC number	Respirator Type	Color	Cartridge/Canister Type	Photo
TC-84A	Non-Powered–Elastomeric • Full or Half Face • Tight-fitting	Olive and Pink	Combination multi-gas with organic vapor and P100** cartridge Multi-gas = Ammonia, Certain Organic Vapors, Chlorine, Chlorine Dioxide, Formaldehyde, Hydrogen Chloride, Hydrogen Fluoride, Hydrogen Sulfide, Methylamine, Sulfur Dioxide	

Protection from anhydrous ammonia, ammonia from livestock, hogs, and poultry.

NIOSH TC number	Respirator Type	Color	Cartridge/Canister Type	Photo
TC-23C	Non-Powered–Elastomeric • Full or Half Face • Tight-fitting	Green	Ammonia chemical cartridge†	

Protection from disinfectants or bleach.

NIOSH TC number	Respirator Type	Color	Cartridge/Canister Type	Photo
TC-23C	Non-Powered–Elastomeric • Full or Half Face • Tight-fitting	Yellow	Acid gas chemical cartridge†	

*Loose fitting does not require fit testing and facial hair is allowed.
**P filters are rated for exposure to oils and are recommended for liquid pesticide and any additives.
†Can add N95 pre filter for particulates like dust or mist (not for use with oil) *OR* can use a combination with P100 cartridge (for use with oil)

PART B-3: Choosing an Atmosphere-Supplying Respirator Based on Agricultural Hazards

Hazard includes organic gas pesticide used in enclosed areas (space and soil fumigants), manure pit hazards (carbon monoxide, hydrogen sulfide, carbon dioxide, methane, oxygen deficiency) and paint spraying (enclosed spraying, isocyanates, urethanes, sensitizing agents).

Special instructions:

If concentrations are unknown, immediately dangerous to life or health (IDLH) conditions may be present due to air contaminant concentrations *OR* oxygen deficiency, additional equipment and training shall include use of:

- A positive pressure or pressure demand regulator **(TC-19 and TC-13F)**
- An emergency escape backup bottle of breathing air **(TC-19)**

NIOSH TC number	Respirator Type	Photo
TC-19C	Atmosphere-Supplying Supplied-Air Respirator (SAR) • Full Face • Tight-fitting • Air Cylinders* • Air Compressors**	
TC-13F	Atmosphere Supplying Self-Contained Breathing Apparatus (SCBA) • Full Face • Tight-fitting	

Air monitoring equipment capable of determining IDLH conditions should be used.

Rescue: See MIOSHA Part 451 Respiratory Protection, 1910.134(g)(3) Procedures for IDLH Atmospheres. Additional standby personnel equipped for IDLH protection in supplied air with backup bottle or SCBA level of protection (with pressure-demand or positive pressure regulator) shall be positioned to provide rapid rescue of any affected individual in a dangerous atmosphere. Retrieval equipment shall be used where it will contribute to the rescue of the worker. Other mandatory requirements apply including the communications and notification requirements found in MIOSHA Part 451, 1910.134(g)(3). The full requirements and training must be met for safe use and rescue from potentially IDLH atmospheres.

*Reference: MIOSHA Part 451, 1910.134(i): Air cylinders must have a Grade D breathing air certificate of analysis. (Oxygen 19.5% – 23.5%, Condensed Hydrocarbon max 5 mg/m^3, CO max 10 ppm, CO^2 max 1000 ppm, lack of noticeable odor.)

**Reference: MIOSHA Part 451, 1910.134(i)(5): Air compressors must be designed to prevent entry of contaminated air into the air-supply system and have suitable in-line purifying sorbent beds and filters to ensure breathing air quality. Sorbent beds and filters must be maintained or replaced following manufacturer instructions. A tag with the most recent change date and signature of the person who changed it must be maintained at the compressor. For non-oil lubricated compressors, CO levels must be kept below 10 ppm. Oil lubricated compressors must have a high temperature or CO alarm or both to monitor CO levels. CO must not exceed 10 ppm in breathing air. Ensure compressor air intakes are not in contaminated areas. Ensure rented equipment has proper filters, sorbent beds and CO alarm.

PART B-4: Air-Purifying Respirator Options by NIOSH Testing & Control (TC) Number

Type	NIOSH prefix	Facepiece	Fit	Reusable	Protects against particulates	Oil resistant	Protects against OV	Protects against fumigants	For use in IDLH atmospheres	Requires fit test	Offers eye protection	Can be worn with facial hair
Gas Mask	TC-14G	Elastomeric	Tight	Yes	With combo canister	With P100 canister	With OV canister	Some, at very low levels	Emergency escape only	Yes	Yes	No
Chemical Cartridge Respirators	TC-23C	Powered hood/ helmet	Loose	Yes	With HE filter	With HE filter	With OV cartridges	No	No	No	Yes	Yes
Chemical Cartridge Respirators	TC-23C	Powered elastomeric	Tight	Yes	With HE filter	With HE filter	With OV cartridges	No	No	Yes	If full-mask	No
Chemical Cartridge Respirators	TC-23C	Non-powered elastomeric	Tight	Yes	No	No	With OV cartridges	No	No	Yes	If full-mask	No
Powered Particulate Respirators	TC-21C	Hood/ helmet	Loose	Yes	Yes	Yes, HE filters	No	No	No	No	Yes	Yes
Powered Particulate Respirators	TC-21C	Elastomeric	Tight	Yes	Yes	Yes, HE filters	No	No	No	Yes	If full-mask	No
Non-powered Particulate Respirators	TC-84A	Elastomeric	Tight	Yes	Yes	With R or P rating	With OV combo cartridges	No	No	Yes	If full-mask	No
Non-powered Particulate Respirators	TC-84A	Filtering Facepiece	Tight	No	Yes	With R or P rating	No	No	No	Yes	No	No

Abbreviations: HE = High efficiency; IDLH = Immediately Dangerous to Life or Health; OV = Organic Vapor
Table source: Adapted from Bernard K. Respirators and Pesticides I, The Right Respirator: Types, NIOSH Numbers, Filter Codes, and Cartridge Colors. University of Maine Cooperative Extension, (webpage with the original table)

*__Note that the following four respirator selections provide protection for liquid pesticide (combination of organic vapor and particulates):__

- Gas mask (TC-14G) elastomeric with combination organic vapor and R/P100 canister.
- Powered (PAPR) hood/helmet loose-fitting Chemical Cartridge Respirator (TC-23C) with a HE filter.
- Powered (PAPR) elastomeric tight-fitting Chemical Cartridge Respirator (TC-23C) with a HE filter.
- Elastomeric Non-Powered Particulate Respirator (TC-84A) with OV combo cartridges and R/P100 filter.

If adding surfactants, adjuvants or other additives, the respirator required for protection may be different than the label. Surfactants, adjuvants or other additives may contain oil requiring an oil-resistant respirator (R or P rating).

PART B-5: Atmosphere-Supplying Respirator Options by NIOSH Testing & Control (TC) Number

Type	NIOSH prefix	Facepiece	Fit	Reusable	Protects against particulates	Oil resistant	Protects against OV	Protects against fumigants	For use in IDLH atmospheres	Requires fit test	Offers eye protection	Can be worn with facial hair
Self-contained Breathing Apparatus (SCBA)	TC-13F	Hood/ helmet*	Loose	Yes	Yes	Yes	Yes	Escape only	No	No	Yes	Yes
Self-contained Breathing Apparatus (SCBA)	TC-13F	Elastomeric	Tight	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Supplied-air Respirator (SAR)	TC-19C	Hood/ helmet	Loose	Yes	Yes	Yes	Yes	No**	No	No	Yes	Yes
Supplied-air Respirator (SAR)	TC-19C	Elastomeric	Tight	Yes	Yes	Yes	Yes	At lower than IDHL levels	If full face pressure demand with auxiliary escape SCBA	Yes	If full-face mask	No

Abbreviations: HE = High efficiency; IDLH = Immediately Dangerous to Life or Health; OV = Organic Vapor
*There is currently no NIOSH Certified TC-13F loose fitting SCBA except for escape use only.
**While some pesticide labels may allow for the use of loose-fitting SAR at lower than IDLH levels, MSU OEM does not recommend TC-19C loose fitting SAR be used to protect against fumigants.
Table source: adapted from Bernard K. Respirators and Pesticides I, The Right Respirator: Types, NIOSH Numbers, Filter Codes and Cartridge Colors. University of Maine Cooperative Extension. (webpage with the original table)

PART B-6: Understanding Pesticide Label Respirator Terms

Always Use One of the Respirators Listed on the Pesticide Label. The Environmental Protection Agency (EPA) regulates the respiratory protection language that pesticide manufactures must put on their product labels (see EPA Pesticide Label Review Manual, Chapter 10, Table 5). The level and type of required respiratory protection is based on the pesticide's form (liquid, solid or gas form), its toxicity category, its vapor pressure and whether the mixture contains oil. The full EPA label criteria for respiratory, skin and eye protection can also be found in the US EPA Pesticide Label Review Manual, Chapter 10 (Worker Protection Labeling) at this webpage.

Outdated Respirator Terms. In some cases, obsolete language may be used on pesticide labels. These are pesticide labels where the label language was approved by the EPA prior to 1995. Older labels will include the phrase "MSHA/NIOSH". The translation to the updated (post 1995) respirator and cartridge type are provided below. If the outdated terms are on the label, use the current terms and the tables in Part B-4 and B-5 of this document to select the correct respirator.

Table of outdated respirator terms used on EPA pesticide labels and the current NIOSH respirator terms used on the labels

OUTDATED Term	**Current Term***
NIOSH/MSHA	NIOSH
Dust/Mist	Use a particulate filter
Pre-filter approved for pesticides	N, R or P filter (particulate), to be used in combination with a chemical cartridge
Canister approved for pesticides	Use a gas mask with a contaminant specific canister. For many pesticides this will be a black organic vapor (OV) ***or*** black and pink (P100) combination canister.
N, R, P or HE filters	N, R or P (particulate) filter ***or*** HE filters (can only be used on Powered Air-Purifying Respirators [PAPR]).

*For liquid pesticides, MSU recommends always using a P100 oil rated filter, in combination with an organic vapor cartridge or canister. Check with the manufacturer for the correct combination cartridge or canister for your mask.

Signal Words on the Label Indicates the Level of Pesticide Toxicity Risk. The label signal words **Danger, Warning or Caution** are chosen based on the level of toxicity for the pesticide in one or more of the six toxicity studies for routes of exposure. The first three studies are for a single exposure and the toxicity level is based on the lethal dose of the pesticide: acute oral, acute dermal, acute inhalation. Toxicity levels for the next two studies are based on the corrosive ability of the pesticide and the amount of irritation to the eye or skin. The final exposure is the potential for allergic contact dermatitis or dermal sensitization. The signal word is based on the most severe toxicity found for any of the five routes. For instance, if required EPA toxicity testing found the pesticide to be corrosive to the eye or ocular irritation ≥21 days and low to no toxicity for the other categories the label would include the signal word DANGER due to the eye hazard result. For the signal word category with the highest toxicity (Category I), the word POISON and the skull and crossbones symbol are also required for products with the highest toxicity for acute oral, acute dermal, or acute inhalation, as well as products that contain ≥4% methanol. (For additional information please see EPA Label Review Manual Chapter 7)

It is important to read all the label warnings and personal protective equipment (PPE) requirements to understand the toxicity concerns and protective measures required for oral, skin, inhalation and eye protection. **Signal words can help identify pesticides that are less toxic to humans.** Label signal words will be one of the following:

Table of signal words found on pesticide labels

Category	Signal Word	Definition
I*	DANGER and POISON	Fatal if swallowed, absorbed through skin or inhaled.
I*	DANGER	Corrosive; causes irreversible eye damage or skin burns.
II*	WARNING	May be fatal if swallowed, absorbed through skin or inhaled; causes substantial but temporary eye injury or skin irritation.
III	CAUTION	Harmful if swallowed, absorbed through skin or inhaled; causes moderate but temporary eye injury or skin irritation.
IV	None Required or CAUTION as optional	Not applicable

*Positive dermal sensitization for a pesticide falls in category I or II and means that prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.
Table Source: EPA Label Review Manual Chapter 7 Precautionary Statements

PART B-7: Particulate Filter Efficiency and Oil Resistance Ratings

Particulate vs. Organic Vapors: Particulates, also called aerosols, are widely varied in size, and include dust, mists, fumes, fibers, smoke, bacteria, viruses and mold. Many of these particulates are found in agricultural work such as grain dust, welding fume, smoke, pesticides, paint, mold spores, fungus and bacteria. Particulates do NOT include vapor from liquids (such as vapor from liquid pesticides or petroleum products), or gases (such as hydrogen sulfide, carbon monoxide, ammonia or other chemical vapor and gases). Respirators and cartridges with filters are designed to capture particulates. **A combination cartridge designed to capture both organic vapors and particulates is recommended for liquid pesticide spraying, as sprayed mist may accumulate on filters and liquid pesticides can have some degree of organic vapor in air, especially as adjuvants are commonly used in the pesticide mixture.**

Oil Resistance Rating: Filters also have an oil resistance rating that determines whether they can be used when oil is present or not. The N rating means not oil resistant. If a pesticide label allows an N class filter, but an oil-based substance has been added to the mix tank, or it is unknown if oil is present, use an R or P class filter. **If using a liquid pesticide and/or additives, it's recommended to use R or P filters.**

Filter Efficiency Rating: Filters are rated 95, 99, 100 or HE (high efficiency). In other words, at a particle size of 0.3 micrometers (microns), they will stop 95, 99 or 99.97% of the particles from entering the breathing zone. Both 100 and HE rated filters are 99.97% efficient at a particle size of 0.3 micron. P100 is the term for respirator cartridges while HE filter is only for use with Powered Air-Purifying Respirators (PAPRs). P100 and HE filters offer the highest efficiency to capture particles and therefore the most protection. P100 and HE filters are colored magenta (or purple) for easy recognition.

The below table lists the types of particulate filters. HE filters are added for comparison. HE filters are only for use with PAPRs, are 99.97% efficient at 0.3 microns and are oil proof rated. N, R or P 100 filters are used with air-purifying respirators. Selection of filter efficiency is often based on the hazard level of the contaminant. If 100 or HE is specified, the 99.97% efficiency is required for that use. **For**

liquid pesticide mixtures, an R or P100 rated filter is recommended for air-purifying respirators and HE for PAPR.

Table with the types of particulate filters for respirators

Respirator	Filter Efficiency	Not Oil Resistant (N)	Oil Resistant (R)	Oil Proof (P)
Air-Purifying	95%	N95	R95	P95
Air-Purifying	99%	N99	R99	P99
Air-Purifying	99.97%	N100	R100	P100
PAPR (HE filter)	99.97%	Not Applicable	Not Applicable	Yes

PART B-8: Cab Filter Selection and Chemical Filter Service Life

It is recommended that applicators:

1. ***Use a cab chemical filter designed for both dust and vapors (with activated carbon) meeting ASABE S613-3.1.***
2. ***Follow the filter manufacturer's ASABE based recommended change schedule.***

Filter Type: Liquid pesticide can be in the form of a particulate (mist), a chemical (vapor) and the mixture may contain oil. Like respirator cartridges, to be protective, cab filters should have a combination particulate and organic vapor (activated carbon) filter. This combination particulate/organic vapor cab filter is not always provided in original equipment and may need to be purchased separately.

Service Life: ASABE is the American Society of Agricultural and Biological Engineering. The ASABE S613-3.1 standard is an agricultural engineering standard that establishes standardized test criteria to determine the predicted filter life. A filter that meets ASABE S613-3.1 test requirements will be more protective against the chemical vapors. When the chemical adsorbing ability of the filter is used up, the chemical vapor can pass unfiltered into the cab. This is called "breakthrough" and means the filter will not provide protection from the chemical vapor. ***Note: Breakthrough = exposure.*** The ASABE 613 testing helps establish when the filters must be changed before their chemical adsorbing ability is used up, preventing unfiltered harmful chemical vapor from entering the cab. Not all filters being sold meet the standard.

Some filters also have an indicator that uses a color change to visibly warn when the filter chemical vapor adsorbing capacity is nearly used up. An example is the PureCab filter shown at right (yellow arrow), which turns dark brown to black as the activated carbon is used up, indicating need for replacement. This visual indicator is an additional tool and not intended to replace the manufacturer's filter change interval. It may show when early replacement is needed due to higher levels of chemical exposure.

Cabin Filter Checklist: Selection and Replacement Recommendations:

To ensure effectiveness as an engineering control in reducing exposure to pesticides or other potentially harmful particulate (aerosol) or chemical vapors, the following best practices are recommended:

Cab Filter Checklist

- ☐ Use a combination particulate and activated carbon filter (original equipment may only include a particulate filter without activated carbon).
- ☐ Use only activated carbon filters that meet the ASABE S613-3.1 chemical filter service life testing standard.
- ☐ Replace the organic vapor/particulate combination filter based on the filter manufacturer replacement interval. This is often 400 hours or 12 months, whichever is less.
- ☐ If the cab air tightness and filtration system does not prevent exposure, wear a respirator inside the cab. Use an organic vapor (OV) cartridge with R or P rated filter.
- ☐ Always have respiratory protection required by the pesticide label in the cab for emergencies and leaving the cab. Wear respiratory protection in the cab if required by the label or Worker Protection Standard (WPS) guidance. (See PART B-9 in this document)

PART B-9: Worker Protection Standard Reduced or Modified PPE Allowances

Can I Reduce the Label-Required PPE If I Spray Pesticide from Inside an Enclosed Cab?

The EPA Label Review Manual and the Worker Protection Standard recognize enclosed cabs as an engineering control that can reduce pesticide exposure in the cab, and that **may** allow (if certain conditions are met) for modification of personal protective equipment (PPE) from that specified on the label.

In cases where PPE reduction may be possible, the pesticide label will refer to the EPA Worker Protection Standard (WPS) regulations to decide. The EPA WPS criteria for when reduced or modified PPE is allowed is summarized in the flow chart on the following page.

Flow Chart (text version): When Does the WPS Say You Can Reduce or Modify PPE Inside a Cab?

- Does the label address the enclosed cab?
    - Answer equals No. Then must wear all required PPE inside the cab.
    - Answer equals Yes. Next question, does the label permit reduced handler PPE in the cab as specified by the WPS? (see label example at bottom of page)
        - Answer equals No. Then must wear all required PPE inside the cab.
        - Answer equals Yes. Next question, is an enclosed cab with properly functioning air ventilation system used and maintained per manufacturer's operating instructions, **AND** is a filtering facepiece respirator (NIOSH TC-84A) or dust/mist filtering respirator the **only** type of respirator required by the pesticide label?
            - Answer equals No. Then must wear all required PPE inside the cab.
            - Answer equals Yes. Then may substitute long sleeved shirt, long pants, shoes and socks for the label PPE. No respirator is required inside the cab. 40 CFR 170.607(e).
                - ***Exception*: If ANY** other type of respirator is required by the pesticide labeling for applicators, that respirator must be worn in the cab.
                - ***MSU OEM Recommends*: Cabin Filter:** Use a cab chemical filter designed for both dust and vapors (with activated carbon) meeting ASABE S613-3.1. If the cab air tightness and filtration system does not prevent exposure, wear a respirator inside the cab. **Respirator:** Use an organic vapor (OV) cartridge with R or P rated filter. See note to Part B-4 of this document for respirator and cartridge options.

Label Example: When handlers use closed systems, enclosed cabs or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides (40 CFR 170.240 (d)(4-6), the handler PPE requirements may be reduced or modified as specified in the WPS. Applicators and flaggers must be in the enclosed cabs.
Ground equipment applicators and flaggers must use an enclosed cab that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(5)].
Note: 40 CFR 170.240(d)(4-6) expired January 2, 2017. When referenced on labels, see 170.607(d-

f) of the WPS. For enclosed cabs specifically, instead of 170.240(d)(5) referenced on labels, see 170.607(e).

PART B-10: Respirator Assigned Protection Factors (APFs)

For **non-pesticide respirator use**, selection is based on making a reasonable estimate of exposure to the air contaminant, and based on exposure concentration, determining the required protection factor needed to bring exposure below occupational exposure limits. Example situations include agitating or entry into a manure pit, silo entry, entry into controlled atmosphere storage, enclosed work using bleach, solvent cleaning, welding, grinding or anhydrous ammonia injection. For occupational exposure limits and further assessment and selection guidance for non-pesticide use, see the table in Part D of this document, specifically the rows for Exposure Assessment and the rows for Selection of respirator.

The APF is the level of protection that a respirator can be expected to provide 95% of the time if properly selected, fitted to the user, and maintained. The APF will vary by type of respirator. Respirators with an APF of 10 can safely be used in an atmosphere that has a hazardous concentration up to 10 times the Permissible Exposure Limit (PEL) for the hazard. In other words, an APF of 10 means that for every 10 parts of contaminant in the atmosphere, a maximum of up to one part can be expected to enter the wearer's breathing zone.

Assigned Protection Factors††

Type of respirator*†	Respirator Mode	Quarter mask	Half mask	Full facepiece	Helmet/ hood	Loose-fitting facepiece
1. Air-Purifying Respirator	Not applicable	5	‡10	50	N/A	N/A
2. Powered Air-Purifying Respirator (PAPR)	Not applicable	N/A	50	1,000	**25/1,000	25
3. Supplied-Air Respirator (SAR) or Airline Respirator	Demand mode	N/A	10	50	N/A	N/A
3. SAR or Airline Respirator	Continuous flow mode	N/A	50	1,000	**25/1,000	25
3. SAR or Airline Respirator	Pressure-demand or other positive-pressure mode	N/A	50	1,000	N/A	N/A
4. Self-Contained Breathing Apparatus (SCBA)	Demand mode	N/A	10	50	50	N/A
4. SCBA	Pressure-demand or other positive-pressure mode (e.g., open/closed circuit)	N/A	N/A	10,000	10,000	N/A

*Employers may select respirators assigned for use in higher workplace concentrations of a hazardous substance for use at lower concentrations of that substance, or when required respirator use is independent of concentration.

†The assigned protection factors in Table 1 are only effective when the employer implements a continuing, effective respirator program as required by this section (29 CFR 1910.134), including training, fit testing, maintenance and use requirements.

‡This APF category includes filtering facepieces, and half masks with elastomeric facepieces.

**The employer must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. This level of performance can best be demonstrated by performing a WPF or SWPF study or equivalent testing. Absent such testing, all other PAPRs and SARs with helmets/hoods are to be treated as loose-fitting facepiece

respirators and receive an APF of 25.
††These APFs do not apply to respirators used solely for escape. For escape respirators used in association with specific substances covered by 29 CFR 1910 subpart Z, employers must refer to the appropriate substance-specific standards in that subpart. Escape respirators for other IDLH atmospheres are specified by 29 CFR 1910.134 (d)(2)(ii).
Table Source: MIOSHA Part 451, 1910.134 Respiratory Protection Table 1 (find here Respiratory Protection Table 1)

WARNING: Other factors are part of exposure assessment and must be considered to determine the proper selection of respiratory protection, such as whether concentrations of any contaminant may approach the immediately dangerous to life or health (IDLH) level, any possible oxygen deficiency, poor warning properties or ability detect breakthrough, and limitation of the cartridges to filter or adsorb the contaminant. **Failure to fully assess exposure during respirator selection could result in fatal or harmful exposures** (see the table in PART D of this document, specifically Non-Pesticide Use and the row for Exposure Assessment, and Part B-11: Reasonable Estimate of Exposure Determination).

PART B-11: Reasonable Estimate of Exposure Determination

Pesticides:

Pesticides are regulated under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). For pesticide respirator use, mixers, sprayers, handlers and employees entering restricted areas must follow the EPA label requirements for all personal protective equipment (PPE) including respiratory protection. The EPA conducts a human health hazard evaluation for each pesticide using chemical characteristics and expected health effects at certain concentrations. Modeling and an applied safety factor are used to predict exposures and determine the level of respiratory protection needed. This assessment and modeling determine the label requirement for the pesticide product. **Under FIFRA, the label is the law**.

Non-Pesticide:

Worker inhalation protection from non-pesticide air contaminants is regulated by MIOSHA in Michigan, and protection of workers is achieved through comparing worker inhalation exposure levels compared to occupational exposure limits (OELs) and requires a reasonable estimate of exposure in the workplace. MIOSHA Part 700 applies directly to Agriculture. Part 451 applies to General Industry or Construction activities on agricultural facilities and adopts the federal respiratory protection standard 29 CFR 1910.134 (See Part D Work Examples and Standards that Apply). Part 700 contains a list of Maximum Allowable Concentrations. Part 451 refers to air contaminant limits set in Part 301 (General Industry) and 601 (Construction). In addition, through the General Duty Clause, MIOSHA may address harmful levels of inhalation exposure to air contaminants not listed in these parts but listed in other known and widely accepted standards including those set by NIOSH (National Institute for Occupational Safety and Health), and ACGIH (the American Conference of Governmental Industrial Hygienists). **Selection is based on exposure. To select the proper level of protection, employers must make a reasonable estimate of employee exposure. This applies to all employers regardless of size.**

Federal OSHA provides written guidance as to what a reasonable estimate of exposure is and acknowledges that small companies may need assistance in conducting the exposure assessment and selecting the right level of respiratory protection. OSHA publications that provide guidance in this

area include OSHA Instruction, Directive CPL 02-00-158, Inspection Procedures for the Respiratory Protection Standard, Section D Selection of Respirators, and the OSHA Small Entity Compliance Guide for the Respiratory Protection Standard.

Employers may need to seek outside expert assistance to measure the concentration of hazardous chemicals in the air, select the appropriate respirator and determine the respirator/cartridge change-out schedule for air-purifying respirators. It is critical to assess the exposure when there is potential for employee overexposure, oxygen deficiency, or atmospheres that are Immediately Dangerous to Life or Health (IDLH).

Sources for assistance include worker compensation carriers, industry associations, private consultants, respirator product vendors and MIOSHA Consultation, Education and Training (CET). MIOSHA CET provides no cost consulting services to small employers including exposure monitoring and has a monitoring equipment loan program. See LEO - Consultation Education and Training.

Non-Pesticide—Reasonable Estimate of Exposure Methods:
Although the most reliable and accurate method to determine exposure is to conduct personal air sampling, this is not explicitly required by OSHA's Respiratory Protection standard, 1910.134, which are adopted in the MIOSHA General Industry and Construction Respiratory Protection Standards. Other means can be used to estimate workplace exposures. Acceptable means include using one or more of the following:

- ***Personal Sampling*:** This is measuring the concentration of hazardous airborne substances in the worker's breathing zone over a set period of time. Personal sampling is done using validated methods such as the OSHA Sampling and Analytical Methods or those in the NIOSH Manual of Analytical Methods protocols. Results are then compared to occupational exposure limits (OELs). The sampling must include expected exposure conditions of each job and work area.
- ***Environmental Screening*:** This method estimates worker exposure based on concentrations of airborne hazardous substances measured by monitors in the work environment. Measures may also include the breathing zone. This method is generally considered less accurate in characterizing employee exposures compared to personal monitoring. However, they can be

especially useful for real time measuring when airborne levels may be highly variable, such as when work being done disturbs material or the internal atmosphere can cause emissions of contaminants at varying levels, for instance during manure pit or silo entry and work. Examples of instruments used include Photoionization Detectors (PIDs), flame ionization detectors (FID), multi-gas detection instruments and chemical detector tubes. The screening equipment must be calibrated following manufacturer instructions and be able to detect and analyze the suspect airborne hazard. Possible chemical interferences that could affect the reading must be assessed to ensure accurate measurement. The user must be trained in the proper use of the instruments and understand its limitations.

- ***Historical Data*:** Previously obtained exposure data may be used as a reasonable assessment if measured under conditions closely resembling the current work in terms of process, type of material, control methods, work practices and environmental conditions. The data should represent the highest likely exposures under reasonably foreseeable conditions of storage, processing, use or handling.
- ***Objective Data*:** Exposure data obtained through industry studies, trade associations or tests conducted by chemical manufacturers may be used if they closely estimate the exposure. The data must represent the highest likely exposures under reasonably foreseeable conditions of storage, processing, use or handling. Process airborne control methods and other conditions must be similar to those of the source data.
- ***Mathematical Approaches*:** The Preamble to the federal OSHA 1910.134 Respiratory Standard 1998 final rule (63 FR 1199) states employers may use data on the physical and chemical properties of air contaminants, combined with information on room dimensions, air exchange rates, contaminant release rates and other pertinent data (including exposure patterns and work practices) to estimate the maximum exposure that could be anticipated in the workplace. This approach is a modeling or simulation. Accuracy is greatly dependent of the ability of the program, and the parameters used.
- ***Safety Data Sheets*:** MIOSHA Parts 42, 92 and 430, adopt the federal OSHA Hazard Communication Standard (1910.1200) as applicable to agriculture under federal OSHA 1910.28, the federal agriculture standards, which also list 1910.1200 as applicable to agriculture workplaces. The MIOSHA Hazard Communication regulations require employers to

inventory the hazardous chemicals in their workplace and to maintain copies of safety data sheets (SDS) for each hazardous chemical. See 1910.1200(e)(1)(i) and (g)(1). SDSs for hazardous chemicals are required to contain information such as the substance's hazard classification, physical and chemical characteristics, toxicological information, and generally applicable control measures. Chemicals that are acutely toxic by inhalation and respiratory sensitizers require precautionary statements. **The Hazard Class Acute Toxicity Inhalation, Category 1 and 2, and hazard class Sensitization Respiratory, Category 1A and 1B require the precautionary statement "In case of inadequate ventilation, wear respiratory protection." Exposure to chemicals in these hazard classes requires assessment if there is a reasonable possibility of overexposure. Some SDSs include recommendations on appropriate respiratory protection.**

PART B-12: Personal Protective Equipment (PPE) Reuse, Cleaning and Disposal Considerations

Reuse and Cleaning—Non-Pesticide Use. Respirators must be stored, inspected, cleaned and repaired to meet MIOSHA Part 451, 1910.134(h) requirements. Elastomeric respirator face pieces may be reused when they can be cleaned and be kept in a sanitary condition by following mandatory MIOSHA Part 451, 1910.134 Appendix B cleaning instructions, or equivalent manufacturer guidance. After disassembly, components should be washed in warm (110°F maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush can be used to facilitate removal of dirt. Rinsing should be in clean, warm water. If the cleaner does not have a disinfectant in it, the respirator components should be immersed for two minutes in one of the following:

- hypochlorite solution (50 ppm chlorine: add one milliliter of laundry bleach to one liter of water at 110°F); or
- an aqueous solution of iodine (50 ppm) by adding 0.8 milliliters tincture of iodine to one liter of water; or
- other commercially available cleaners of equivalent disinfectant quality, if recommended or approved by the respirator manufacturer.

Reuse and Cleaning—Pesticide Use. Follow the label on the pesticide product. The EPA label review manual* requires the statements for contaminated PPE to appear in the PRECAUTIONARY STATEMENTS section of the labeling. The preferred location is directly below the Personal Protective Equipment (PPE) language. All occupational use products must bear the following statements:

- ***"Follow the manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry."***

If the product is a concentrate (diluted before use, or is an ultra-low-volume or low-volume concentrate, or contains more than 50% active ingredient) and is in Toxicity Category I or II, its label must include the following statement before the previous statement:

- ***"Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them."***

*Reference: EPA Label Review Manual, Chapter 10: Worker Protection Labeling, paragraph B, Statements for Contaminated PPE.

Disposal and Hazardous Waste Considerations—All PPE.

Respirators, cartridges and other personal protective equipment (PPE) may become contaminated with hazardous chemicals during use. *For pesticide use*, chemical cartridges and other sorbent materials should be discarded and not reused per precautionary statement guidance on the label described above and based on when they reach their end of serviced life as described in the At-A-Glance and Part D tables of this guide. The EPA worker protection standard (WPS), adopted in Michigan, maximum service life is one shift. *For non-pesticide use*, replace cartridges following end of service life criteria in At-A-Glance and Part D tables for non-pesticide use section of this guide. For tractor cab filters, also follow cartridge replacement as described in the tables and Part B-8 of this guide. The EPA-approved label and safety data sheets should always be consulted for product specific disposal guidance.

In addition to following the reuse and disposal criteria above, it may be necessary to consider local or state hazardous waste compliance when disposing of contaminated PPE. Disposal of contaminated PPE may or may not be considered hazardous waste.

Pesticides should be evaluated prior to use to determine whether wastes generated may be considered hazardous and require special disposal. Similarly, non-pesticide chemical contaminants should be evaluated prior to generating waste streams. The Michigan Department of the Environment, Great Lakes and Energy (EGLE) Assist Center can be reached at 800-662-9278 or EGLE-Assist@Michigan.gov for assistance.

PART C:
Respirator Program Checklists

Respirator Safety Program Checklist

Employee Name	Medical Evaluation	Cleared for respirator use?	Respirator type(s) authorized by PLHCP	Annual fit-test passed?	Annual training completed?	Inspected proper use?	Inspected storage procedures?	Inspected cleaning procedures?

Recommended use: Write the date of completion in each field instead of a simple Yes/No answer.

Adapted from resources distributed by the Pesticide Educational Resources Collaborative.

PERC Pesticide Educational Resources Collaborative

MICHIGAN STATE UNIVERSITY | Extension

Respirator Inspection Checklist

Employer name: Date:

Respirator Part	Items to check
Face piece	■ No cracks, rips/tears, or holes ■ No facemask distortion ■ No cracked or loose lenses or face shields
Head straps	■ No breaks or rips/tears ■ No broken buckles
Valves	■ No residue, dirt, cracks, or rips/tears in valve material
Filters & cartridges	■ National Institute for Occupational Safety and Health (NIOSH) approved ■ Gaskets seat properly ■ No cracks or dents in housing ■ Proper cartridge for hazards ■ Use cartridge with Service Life Indicator
Air supply systems	■ Breathing-quality air is used ■ Supply hoses are in good condition ■ Hoses are properly connected ■ Settings on regulators and valves are correct ■ Record of filter service/changes per manufacturer interval ■ Record of carbon monoxide (CO) alarm testing/calibration per manufacturer

Disclaimer: This checklist represents an overview of respirator inspection requirements. Always refer to the manufacturer's user manual for more detailed information.

Adapted from resources distributed by Pesticide Educational Resources Collaborative.

PERC Pesticide Educational Resources Collaborative

MICHIGAN STATE UNIVERSITY | Extension

Respirator fit-test record

Note: Fit Testing Procedures may be found in Appendix A in 1910.134 of Code of Federal Regulations

Date:

Employee name:

Job/Classification:

Department:

Fit test method:

Clean shaven during test (Yes or No):

Type of respirator	Make/model/size	Fit factor/results

Person/Service Provider performing the fit test:

Problems the employee has encountered with their respirators:

Conditions which could affect respirator fit:

- ☐ Clean Shaven
- ☐ Facial Hair
- ☐ Glasses
- ☐ Facial Scar
- ☐ Dentures absent
- ☐ Teeth Missing
- ☐ Other

Comments:

Adapted from resources distributed by Pesticide Educational Resources Collaborative and NC State Center for Integrated Pest Management.

PART D:
Expanded Respirator Program Element Guidance

Detailed guidance by element for both pesticide and non-pesticide respirator use situations

NOTE: The tables below refer only to respiratory requirements and guidelines. It does not address skin, eye or other types of protection that may be required. For pesticides, follow the label requirements for all PPE including skin or eye protection during handling mixing and applying, area entry, storage, cleaning and disposal. For non-pesticide PPE determinations for skin, eye or other hazards, a hazard assessment should be conducted using safety data sheet (SDS) requirements and PPE manufacturer technical guidance to properly select a level and type of protection based on the hazard.

Pesticide Use Detailed Element Guidance

Part D Expanded Respirator Program Guidance: Pesticide Use Elements #1-3

Element	Agricultural Use	Non-Agricultural Use
Protect Against	Pesticides used in farms, greenhouses and nurseries in production of agricultural plants.	Pesticide(s) use not directly associated with plant production. (i.e. grass, weed, vermin, insect control not part of agriculture production)
Work Examples	Controlling insects or fungi for crops or production plants, weed control in growing crops or production plants/trees.	Control of weeds on a golf course, insect control not on crops or production plants/trees.
Standards that Apply	Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Environmental Protection Agency (EPA): 40 CFR 152 MDARD Reg 637 Rule 4 Pesticide Use Worker Protection Standard (WPS) for Workers	FIFRA EPA: 40 CFR 152 MDARD Reg 637, Rule 4 Pesticide Use WPS Does Not Apply

Part D Expanded Respirator Program Guidance: Pesticide Use Elements #4-6

Element	Agricultural Use	Non-Agricultural Use
Written Hazard Guidance	Follow EPA Labeling to protect Handlers and Workers. Follow Agriculture Use block on label. Implement WPS program.	Follow EPA Labeling to protect Handlers. Follow Non-Agriculture Use block on label. Follow area exclusion rules on label.
Written Program Requirements	NO. Certain program elements required to be documented. See documentation requirements. OEM recommends written program follow OSHA 1910.134(c).	NO. WPS not applicable. OEM recommends written program follow OSHA 1910.134(c).
Respirator Program Administrator Designated in Writing	Not specified. Certified applicator required for restricted use or commercial application pesticide. Employer must implement protections for workers in WPS.	Not specified. Certified applicator required for restricted use or commercial application of pesticide.

Part D Expanded Respirator Program Guidance: Pesticide Use Elements #7-9

Element	Agricultural Use	Non-Agricultural Use
Exposure Assessment Required	EPA Performs Human Exposure Risk Assessment. (See Reference 5-9)	EPA Performs Human Exposure Risk Assessment. (See Reference 5-9)
Selection: Immediately Dangerous to Life or Health (IDLH) or Potential IDLH	Follow Label (i.e. enclosures, fumigation).	Follow label. Safety Data Sheet (SDS).
Selection: Non-IDLH	LABEL prescribes respirator. NIOSH Approved TC Number or Type Specified on Label	LABEL prescribes respirator. Check product Safety Data Sheet (SDS). Consult manufacturer technical assistance or consultant.

Part D Expanded Respirator Program Guidance: Pesticide Use Element #10

EPA Label Respirator Criteria For Determining Respiratory Protection for both Agricultural and Non-Agricultural Use

- Read EPA Label Review Manual Table 5 Respirator Language
- Acute Toxicity Categories for Pesticide Products. Read 156.62 Toxicity Category

Part D Expanded Respirator Program Guidance: Pesticide Use Elements #11-13

Element	Agricultural Use	Non-Agricultural Use
Medical Evaluation	YES MUST OCCUR BEFORE FIT TEST OR USE or if there is any change in medical condition or respirator use (see OSHA 1910.134(e)(7)). The OSHA 1910.134 Appendix C screening questionnaire is required to be used. PLHCP must provide a written determination for respirator type and use and list any limitations.	YES MUST OCCUR BEFORE FIT TEST OR USE or if there is any change in medical condition or respirator use (see OSHA 1910.134(e)(7)). The OSHA 1910.134 Appendix C screening questionnaire is required to be used. PLHCP must provide a written determination for respirator type and use and list any limitations.
Fit Testing	YES—WPS specifies before use and annually. OSHA 1910.134 Appendix A procedures must be used.	Not specified—WPS not applicable. OEM recommends before use and annually and use OSHA 1910.134 Appendix A procedures.
Training & Information	YES Per WPS—Before use and annually	Not specified OEM recommends follow WPS before use and annually.

Part D Expanded Respirator Program Guidance: Pesticide Use Elements #14-16

Element	Agricultural Use	Non-Agricultural Use
Cartridge Change Schedule Required	YES 40 CFR 170.507—Use WPS criteria in next section below (Element #17). OEM Recommends End of Service Life Indicator (ESLI). Max 8 hours use per WPS—see below (Element #17).	NO OEM recommends use WPS criteria in next section below (Element #17). OEM Recommends ESLI. Max 8 hours use per WPS—see below (Element #17)
Procedures Routine & Emergency Use	YES – per label	Per label OEM recommends OSHA 1910.134(g)
Cleaning, disinfecting, storing, inspecting, repairing, discarding, & maintaining	YES – per WPS. see label Special Precautions section PPE guidance.	YES – see label Special Precautions section PPE guidance.

Part D Expanded Respirator Program Guidance: Pesticide Use Element #17

Pesticide Cartridge Change Schedule 40 CFR 170.507 (WPS)

WPS-Particulate Filter or Cartridge:

- When breathing resistance becomes excessive.
- When the filter element has physical damage or tears.
- According to manufacturer's recommendations or pesticide product labeling, whichever is more frequent.
- *In the absence of any other instructions or indications of service life, at the end of eight hours of cumulative use.*

WPS Gas or Vapor Cartridges:

- At the first indication of odor, taste, or irritation. (note: breakthrough = exposure)
- When the maximum use time is reached as determined by a change schedule conforming to the provisions of 29 CFR 1910.134(d)(3)(iii)(B)(2) (based on objective data/breathing zone personal monitoring).
- According to manufacturer's recommendations or pesticide product labeling instructions, whichever is more frequent.
- *In the absence of any other instructions or indications of service life, at the end of eight hours of cumulative use*.
- When breathing resistance becomes excessive.

Part D Expanded Respirator Program Guidance: Pesticide Use Elements #18-20

Element	Agricultural Use	Non-Agricultural Use
Ensuring adequate quality, quantity, and flow of atmosphere supplying sources	YES—per WPS	YES OEM recommends following OSHA 1910.134(i).
Program Evaluation Procedures	Not specified OEM recommends evaluation per OSHA 1910.134(l).	Not specified OEM recommends evaluation per OSHA 1910.134(l).
Documentation Requirements	2-year retention	Not specified OEM recommend follow OSHA 1910.134(m) and OSHA 1910.1020.

Non-Pesticide Use Detailed Element Guidance

Part D Expanded Respirator Program Guidance: Non-Pesticide Use Elements #1-3

Element	Agricultural Process or Operation	Non-Agricultural Process or Operation
Protect Against	Dust, mist, vapor, fume, fiber, (i.e. grain dust, manure pit gas, oxygen deficiency, ammonia, mold, biologicals, plant dust).	Dust, mist, vapor, fume, fiber, (i.e., silica dust, paint or chemical vapor/gas, tar pitch, oil mist, welding fume).
Work Examples	Examples include pumping out a manure pit or repairing the pump, entering enclosed or underground spaces, operating internal combustion engine equipment in enclosed or partially enclosed areas, anhydrous ammonia fertilizer operations, disturbing of mold, rat feces, bird droppings or inhalable plant or crop dusts or fibers.	**Construction:** Crystalline silica exposure during concrete drilling, cutting or grinding. Granite or other silica-based material work. Painting, welding, roofing coatings. Construction includes work for new construction, repairs that are not routine maintenance and any alterations including painting. **General Industry** maintenance work, including welding, brake replacement or other routine repair work involving inhalation hazards.
Standards that Apply	MIOSHA Part 700, R325 Occupational Health	MIOSHA Part 451 Respiratory Protection (incorporates OSHA 1910.134) Act 154, General Duty adopt TLV, NIOSH REL or other OEL if no PEL defined (serious hazard) Air Contaminants MIOSHA Part 301 (GI), MIOSHA Part 601 (CONST)

Part D Expanded Respirator Program Guidance: Non-Pesticide Use Elements #4-6

Element	Agricultural Process or Operation	Non-Agricultural Process or Operation
Written Hazard Guidance	MIOSHA Part 430, Hazard Communication Standard Label, Warnings, and Safety Data Sheet	MIOSHA Part 42 (CONST), MIOSHA Part 92 (GI), Hazard Communication Standard Label, Warnings, and Safety Data Sheet
Written Program Requirements	Not specified. Certain program elements in place determined by a qualified individual. OEM recommends written program follow OSHA 1910.134(c).	YES OSHA 1910.134(c)
Respirator Program Administrator Designated in Writing	MIOSHA Part 700, Reg 325.2442 Requires a qualified individual with sufficient knowledge of the subject.	YES OSHA 1910.134(c)

Part D Expanded Respirator Program Guidance: Non-Pesticide Use Elements #7-9

Element	Agricultural Process or Operation	Non-Agricultural Process or Operation
Exposure Assessment Required	YES See element #10 below for MIOSHA Part 700	YES OSHA 1910.134(d)(1)(iii) must make reasonable estimate of exposure.

Element	Agricultural Process or Operation	Non-Agricultural Process or Operation
Selection: Immediately Dangerous to Life or Health (IDLH) or Potential IDLH	Hose mask with blower, or SCBA or self-rescue mouthpiece (escape only if oxygen). OEM recommends following OSHA 1910.134.	Full Face Supplied-Air Respirator (SAR) with pressure demand regulator and auxiliary SCBA, or SCBA with pressure demand or positive pressure regulator.
Selection: Non-IDLH	Selection vested in qualified individual, MIOSHA Part 700, Reg 325.2442. MIOSHA Part 700, Reg 325.2442b, Types listed in regulation: Airline respirator; OR Gas Mask with canister or canister and filter; OR Hose mask with blower; OR Respirator with chemical cartridge or filter or both.	Reasonable estimate of exposure (i.e. industrial hygiene [IH] monitoring). Choose respirator to ensure exposure is below Permissible Exposure Level (PEL) based on Assigned Protection Factor of respirator (see table in Section B-10 of this document).

Part D Expanded Respirator Program Guidance: Non-Pesticide Use Element #10

MIOSHA Exposure Assessment Criteria Part 700 (Agriculture), Reg 325

- Reg 325.2411 Exposure must be below the Max Allowable Contaminant level (MAC) as written in 325.2412 to 325.2419, AG 700 AND
- Exposure to a contaminant or combination of contaminants must not be in concentrations that are hazardous or injurious to health, AND
- Reg 325.2442 Responsibility for equipment **selection, issuance, use, training and maintenance** shall be vested in a *qualified individual who shall have sufficient knowledge of the subject*.

Part D Expanded Respirator Program Guidance: Non-Pesticide Use Elements #11-13

Element	Agricultural Process or Operation	Non-Agricultural Process or Operation
Medical Evaluation	YES Vested in a qualified individual who shall have sufficient knowledge of the subject. OEM recommends following OSHA 1910.134(e) and 1910.134 Appendix C. Must occur BEFORE fit test or use, OR if any change in medical condition or respirator use (see OSHA 1910.134(e)(7)).	YES MUST OCCUR BEFORE FIT TEST OR USE, or if any change in medical condition or respirator use (see OSHA 1910.134(e)(7)). Screening questionnaire required. PLHCP must provide a written determination for respirator type, use and any limitations. OSHA 1910.134(e) and 1910.134 Appendix C
Fit Testing	YES Vested in a qualified individual who shall have sufficient knowledge of the subject. OEM recommends following OSHA 1910.134 Appendix A. Fit test BEFORE use and annually.	YES Before use and annually. OSHA 1910.134 Appendix A.
Training and Information	YES Vested in a qualified individual who shall have sufficient knowledge of the subject. OEM recommends following OSHA 1910.134(k) and 1910.134 Appendix A.	YES Before use and annually. OSHA 1910.134(k) and 1910.134 Appendix A

Part D Expanded Respirator Program Guidance: Non-Pesticide Use Elements #14-16

Element	Agricultural Process or Operation	Non-Agricultural Process or Operation
Cartridge Change Schedule Required	YES MIOSHA Part 700, Reg 325.2442 Qualified Individual to determine. OEM Recommends End of Service Life (ESLI) or Objective data in writing.	YES ESLI or objective data in writing.
Procedures Routine and Emergency Use	YES Vested in a qualified individual who shall have sufficient knowledge of the subject. OEM recommends following OSHA 1910.134(g)	YES OSHA 1910.134(g)
Cleaning, disinfecting, storing, inspecting, repairing, discarding, & maintaining	YES Vested in a qualified individual who shall have sufficient knowledge of the subject. OEM recommends following OSHA 1910.134(h)	YES Follow manufacturer and OSHA 1910.134(h) and 1910.134 Appendix B-2 for respirator cleaning. Follow Michigan EGLE waste requirements for disposal. (800) 662-9278, EGLE-Assist@michigan.gov.

Part D Expanded Respirator Program Guidance: Non-Pesticide Use Elements #17-19

Element	Agricultural Process or Operation	Non-Agricultural Process or Operation
Ensuring adequate quality, quantity, and flow of atmosphere supplying sources	YES Vested in qualified individual with sufficient knowledge of the subject. OEM recommends following OSHA 1910.134(i).	YES OSHA 1910.134(i)
Program Evaluation Procedures	Not specified Vested in a qualified individual who shall have sufficient knowledge of the subject. OEM recommends following OSHA 1910.134(l).	YES As necessary to ensure the written program is being effectively implemented and continues to be effective. OSHA 1910.134(l)
Documentation Requirements	Not specified Vested in a qualified individual who shall have sufficient knowledge of the subject. OEM recommends following OSHA 1910.134(m) and OSHA 1910.1020.	Fit Test kept until next test. Medical Evaluation—keep for employment duration plus 30 years. OSHA 1910.134(m) and OSHA 1910.1020

REFERENCES

1. "Worker Protection Standard (WPS) Respiratory Protection Guide, Requirements for Employers of Pesticide Handlers", Pesticide Educational Resource Collaborative, Revision 2017. for reference 1
2. "How to Comply With the 2015 Revised Worker Protection Standard For Agricultural Pesticides", US Environmental Protection Agency (EPA) and Pesticide Educational Resource Collaborative (PERC), September 2016.
3. Pesticide Educational Resources Collaborative (PERC), for reference 3
4. AgSafe Pesticide Safety, for reference 4
5. EPA Office of Pesticide Programs - Worker Safety, for reference 5
6. How EPA Protects Workers from Pesticide Risk, for reference 6
7. Overview of Risk Assessment in the Pesticide Program, for reference 7
8. Assessing Human Health Risk from Pesticides, for reference 8
9. Rapid Chemical Exposure and Dose Research, for reference 9
10. Association of American Pesticide Control Officials, for reference 10
11. OSHA Occupational Heat Exposure Information, for reference 11
12. Code of Federal Regulations, EPA, Title 40, Chapter I, Subchapter E, Part 152, Subpart I – Classification of Pesticides, for reference 12
13. US EPA Pesticide Label Review Manual, Chapter 10, for reference 13
14. Phillips B, Chester D, Anderson C, Millerick-May M. "Vegetable Pesticide Series: Does It Require a Respirator? A 2018 Worker Protection Standard respirator requirement guide for vegetable growers", MSU Extension. March 16, 2018. for reference 14
15. Jubenville J, Parsons E. A simple Worker Protection Standard-compliant respirator program for agricultural employers, MSU Extension. March 06, 2024. for reference 15
16. Michigan MDARD regulations. for reference 16
17. Respirator Assigned Protection Factors (APFs) 1910.134(d)(3)(i)(A)
18. Acute Toxicity Categories for Pesticide Products. 156.62 Toxicity Category, for reference 18
19. Farm Respiratory Protection, for reference 19

20. Respirators and Pesticides I: The Right Respirator: Types, NIOSH Numbers, Filter Codes, and Cartridge Colors, for reference 20
21. NIOSH Main Respiratory Protection Subject Page, for reference 21
22. Bollinger N. NIOSH Respirator Selection Logic. US Department of Health and Human Services, CDC, NIOSH. October 2004. Publication No. 2005-100 for reference 22
23. Respirator Tool Kit: Upper Midwest Agricultural Safety and Health Center, for reference 23
24. Pesticide Container and Containment Regulations at a Glance, Table 6: Container Labeling (40 CFR part 156 Subpart H).
25. Agriculture Respirator Selection Guide by AgriSafe Network, for reference 25

GLOSSARY

The following section contains definitions and further descriptions of select technical terms that may be unfamiliar to the guide user. Where applicable, sources are provided.

Air-Purifying Respirator (APR) means a respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element. OSHA 29 CFR 1910.134(b).

Assigned Protection Factor (APF) means the workplace level of respiratory protection that a respirator or class of respirators is expected to provide to employees when the employer implements a continuing, effective respiratory protection program as specified by this section. A higher protection factor is more protective. OSHA 29 CFR 1910.134(b).

Atmosphere-Supplying Respirator means a respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere and includes supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units. OSHA 29 CFR 1910.134(b).

Canister or Cartridge means a container with a filter, sorbent, or catalyst or combination of these items, which removes specific contaminants from the air passed through the container. OSHA 29 CFR 1910.134(b).

Elastomeric Respirator means a type of respirator with a facepiece made of synthetic or rubber materials that form a seal against the user's face, with properties that allow the original shape to be repeatedly reestablished if it is temporarily deformed. The facepiece of the elastomeric respirator should form a tight seal against the user's face and requires fit testing. Understanding respiratory protection options in Healthcare: The Overlooked Elastomeric article can be found at this link.

End-of-Service-Life Indicator (ESLI) means a system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective. OSHA 29 CFR 1910.134(b).

Filter or Air-Purifying Element means a component used in respirators to remove solid or liquid aerosols from the inspired air. OSHA 29 CFR 1910.134(b).

Filtering Facepiece (dust mask) means a negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium. OSHA 29 CFR 1910.134(b).

Fit Test means the use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual (See also glossary definition for Qualitative fit test QLFT and Quantitative fit test QNFT). OSHA 29 CFR 1910.134(b).

High Efficiency Particulate Air (HEPA) Filter means a filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. The equivalent NIOSH 42 CFR 84 particulate filters are the **N100, R100, and P100 APR filters, and HE filters in PAPRs**. OSHA 29 CFR 1910.134(b).

Immediately Dangerous to Life or Health (IDLH) means an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere. OSHA 29 CFR 1910.134(b).

Loose-Fitting Facepiece means a respiratory inlet covering that is designed to form a partial seal with the face. OSHA 29 CFR 1910.134(b).

Maximum Allowable Contaminant Level (MAC) means the threshold limit value or the time-weighted average 8-hour airborne concentration of a contaminant to which a person may be safely exposed. MIOSHA Part 700, R325.2403, Rule 3(a). R 325.2413 to R 325.2419, Tables 1 to 7, refer to the MAC of a particular contaminant.

Maximum Use Concentration (MUC) means the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected when wearing a respirator and is determined by the assigned protection factor of the respirator or class of respirators and the exposure limit of the hazardous substance. The MUC can be determined mathematically by multiplying the assigned protection factor specified for a respirator by the required OSHA permissible exposure limit, short-term exposure limit or ceiling limit. When no OSHA exposure limit is available for a hazardous substance, an employer must determine an MUC on the basis of relevant available information and informed professional judgment. OSHA 29 CFR 1910.134(b).

Milligrams Per Cubic Meter (mg/m3) refers to how many milligrams of a particulate or chemical are in one cubic meter, as measured during exposure monitoring. Some occupational exposure limits

(OELs), especially particulates, are expressed in these units. MIOSHA Part 700, R325.2403.

Negative Pressure Respirator (tight-fitting) means a respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator. OSHA 29 CFR 1910.134(b).

Oxygen Deficient Atmosphere means an atmosphere with an oxygen content below 19.5% by volume. OSHA 29 CFR 1910.134(b).

Parts Per Million (PPM) means parts of vapor or gas per million parts of air by volume at 25 degrees Celsius and 760 millimeters of mercury pressure. MIOSHA Part 700, R325.2403, Rule 3(e).

Permissible Exposure Limit (PEL) means the occupational exposure limit set by OSHA. The PEL-TWA is the 8-hour time-weighted average limit for 8-hour shift and 40-hour work week exposure. The PEL-STEL is a 15-minute time weighted exposure that an employee can be exposed to for up to four times per shift, if the PEL-TWA exposure remains below the PEL-TWA limit. Not all substances have a PEL-STEL. OSHA 1910.1000, 19109.1028.

Pests (EPA 49 CFR 152.5) – an organism is declared to be a pest under circumstances that make it deleterious (harmful) to man or the environment, if it is:

a) Any vertebrate animal other than human;
b) Any invertebrate animal, including but not limited to, any insect, other arthropod, nematode or mollusk such as a slug and snail, but excluding any internal parasite of living human or other living animals;
c) Any plant growing where not wanted, including any moss, alga, liverwort or other plant of any higher order, and any plant part such as a root; or
d) Any fungus, bacterium, virus, prion or other microorganism, except for those on or in living man or other living animals and those on or in processed food or processed animal feed, beverages, drugs (as defined in FFDCA section 201(g)(1)) and cosmetics (as defined in FFDCA section 201(i)).

Pesticide means any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest. It also includes substances intended for use as a plant regulator, defoliant, or desiccant, as well as nitrogen stabilizers. Pesticides include all herbicide, insecticide, fungicide, rodenticide, biocide or regulated disinfectants. The Federal Insecticide, Fungicide and

Rodenticide Act (FIFRA) is the Federal statute that governs the registration, distribution, sale and use of pesticides in the United States. US Environmental Protection Agency. (see 40 CFR 152.6 –152.15 for additional clarification).

Physician or Other Licensed Healthcare Professional (PLHCP) means an individual whose legally permitted scope of practice (i.e., license, registration or certification) allows them to independently provide, or be delegated the responsibility to provide, some or all of the health care services required by paragraph (e) of this section. OSHA 29 CFR 1910.134(b).

Positive Pressure Respirator means a respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator. OSHA 29 CFR 1910.134(b).

Powered Air-Purifying Respirator (PAPR) means an air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering. OSHA 29 CFR 1910.134(b).

Pressure Demand Respirator means a positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation. OSHA 29 CFR 1910.134(b).

Qualitative Fit Test (QLFT) means a pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent. OSHA 29 CFR 1910.134(b).

Quantitative Fit Test (QNFT) means an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator. OSHA 29 CFR 1910.134(b).

Recommended Exposure Limit (REL) is the NIOSH recommended occupational exposure limit. REL-TWA indicates a time-weighted average concentration for up to a 10-hour workday during a 40-hour workweek. The REL-ST is the short-term NIOSH exposure limit, a 15-minute time weight average exposure that should not be exceeded. A ceiling REL is designated by a C preceding the value, and unless noted should not be exceeded at any time. CDC-NIOSH Pocket Guide to Chemical Hazards, DHHS Publication 2005-149, 09-2007.

Self-Contained Breathing Apparatus (SCBA) means an atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user. OSHA 29 CFR 1910.134(b).

Service Life means the period of time that a respirator, filter or sorbent, or other respiratory equipment provides adequate protection to the wearer. OSHA 29 CFR 1910.134(b).

Supplied-Air Respirator (SAR) or Airline Respirator means an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user. OSHA 29 CFR 1910.134(b).

Tight-Fitting Facepiece means a respiratory inlet covering that forms a complete seal with the face. OSHA 29 CFR 1910.134(b).

Threshold Limit Values (TLVs) refer to the occupational exposure limits (OELs) set by the American Conference of Governmental Industrial Hygienists (ACGIH), a private, not for profit, non-governmental scientific association comprised of occupational safety and health professionals. TLVs refer to airborne concentrations of chemical substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, over a working lifetime, without adverse health effects. TLV-TWA refers to the concentration for a conventional 8-hour workday and 40-hour workweek. TLV-STEL refers to the short-term exposure limit, a 15-minute time-weighted average that should not be exceeded at any time during a workday, even if the TLV-TWA is not exceeded. The TLV-STEL should occur no more than four times per workday, with at least 60 minutes between exposures. The TLV-SL refers to the concentration on workplace equipment and facility surfaces that is not likely to result in adverse effects from direct or indirect contact. The TLV-SL supplements airborne TLVs especially for skin or sensitization agents. Surface measures are expressed in mg/100cm2. TLV-C refers to ceiling limits that should not be exceeded during any time of the working exposure. Where there is no TLV-STEL, ACGIH recommends peak exposures about a TLV-TWA be limited to between three and five times the value of the TLV-TWA, no more than four occasions per work shift. Reference: ACGIH Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) based on the documentation of the Threshold Limit Values for chemical substances and physical agents and biological indices, 2024 (TLV and BEI guidelines).

User Seal Check means an action conducted by the respirator user to determine if the respirator is properly seated to the face. OSHA 29 CFR 1910.134(b).

Vermin is used for any small, harmful or annoying insect or animal that is difficult to get rid of or control. Fleas, lice, mice, rats and even rabbits when they destroy gardens have been called vermin. They are often considered pests that can spread diseases and damage crops, livestock and property. The term can also encompass wild animals that compete at a particular time and place for food with humans or domestic animals. Merriam-Webster Online Dictionary.

Vermin Control. MIOSHA Part 474, 1910.141(a)(5) for vermin control requires all permanent workplaces prevent the harborage of rodents, insects and other vermin. A continuing and effective extermination program must be put in place where their presence is detected. Pesticide application may be for vermin control as directed by the label.

APPENDIX A: Posters

NIOSH RESPIRATOR FILTER CLASSES

NIOSH classifies the filtering media in respirators based on its resistance to oil and its particle filtering efficiency. The resistance to oil is designated as “N”, “R”, or “P”. Particle filtering efficiency is designated “95”, “99”, or “99.97”.

NOT RESISTANT TO OIL

N95, N99, N100
Filters at least 95%, 99%, or 99.97% of airborne particles

SOMEWHAT RESISTANT TO OIL

R95, R99, R100
Filters at least 95%, 99%, or 99.97% of airborne particles

STRONGLY RESISTANT TO OIL/OIL PROOF

P95, P99, P100
Filters at least 95%, 99%, or 99.97% of airborne particles

OILS

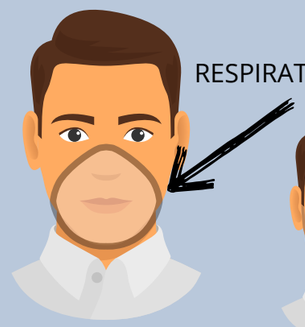
When products containing oil (like fuel, lubricating or hydraulic oils, solvents, paints, and pesticides) are sprayed or used in processes producing aerosols or droplets, the oil component may become airborne.

CDC NIOSH
U.S. Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

NIOSH Respirator Trusted-Source:
https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/RespSource.html
NIOSH Respirator Selection Logic:
https://www.cdc.gov/niosh/docs/2005-100/pdfs/2005-100.pdf

Facial Hairstyles and Filtering Facepiece Respirators

Intended for workers who wear tight-fitting respirators



CLEAN SHAVEN ✓


STUBBLE ✗


LONG STUBBLE ✗


FULL BEARD ✗


FRENCH FORK ✗


DUCKTAIL ✗


VERDI ✗


GARIBALDI ✗


BANDHOLZ ✗


SOUL PATCH ✓


GOATEE ✓
(Careful! Chin hair may easily cross the seal)


CHIN CURTAIN ✗


EXTENDED GOATEE ✗


CIRCLE BEARD ✗


ANCHOR ✓


BALBO ✓

(Careful! Chin hair may easily cross the seal)


VAN DYKE ✗


IMPERIAL ✗


SIDE WHISKERS ✓


MUTTON CHOPS ✗


HULIHEE ✗


HORSESHOE ✓
(Careful not to cross the seal)


ZAPPA ✓


WALRUS ✓


PAINTER'S BRUSH ✓


CHEVRON ✓


HANDLEBAR ✓


PENCIL ✓


PENCIL ✓


LAMPSHADE ✓


ZORRO ✓


VILLAIN ✓
(Careful not to cross the seal)


WET NOODLE ✗


ENGLISH ✗


DALI ✗

*If your respirator has an exhalation valve, some of these styles may interfere with the valve working properly if the facial hair comes in contact with it.
†This graphic may not include all types of facial hairstyles. For any style, hair should not cross under the respirator sealing surface.
Source: OSHA Respiratory Protection Standard
https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=12716
Further Reading: NIOSH Respirator Trusted-Source Webpage
https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/respsource3fittest.html

Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

2017